

ADVANCED FOOD MICROBIOLOGY FOS6226C

Fall 2013

Mon 11:45-1:40 FSHN Teaching Lab

Tues 10:40-11:30, FSHN Conf Room

Wed 10:40 -1:40 FSHN Teaching Lab

Thurs 10:40-11:30, FSHN Conf Room

Instructor: Dr. Anita C. Wright

Office Hours: T 2:00- 4:00

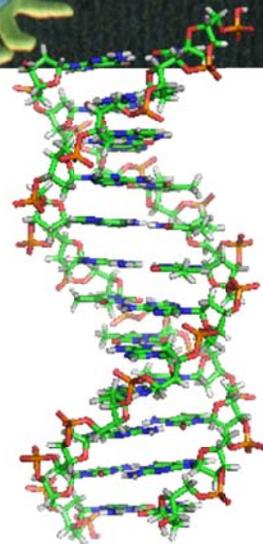
(or come by anytime)

Aquatic Food Products Lab Room 214

392-1991x311, acw@ufl.edu

Website:

<http://fshn.ifas.ufl.edu/faculty/ACWright/index.html>



Text: none, material will come from handouts, journal articles, and lecture

Course overview: This course will focus on methods and current issues that are relevant to the field of Food Microbiology and to the investigation of food-borne pathogens. The format for this course will integrate current research with laboratory exercises and incorporate independent research by the student. Reading of scientific literature will be strongly emphasized, as it is essential to graduate studies and to all career paths in Food Microbiology. Students will lead discussions throughout the semester and prepare a presentation on selected research papers. For the lab, each student will maintain a lab notebook and write an independent research project based on the results they obtained from their experiments.

Learning Objectives: The course will enable students to master the following skills:

- Critically evaluate and comprehend current literature and research in Food Microbiology.
- Use some of the tools of modern Food Microbiology or quantitative analysis, molecular typing analyses such as rep-PCR and multilocus DNA sequence typing.
- Understanding of the basic concepts of microbial pathogenesis, risk assessment, bacterial growth determinants and microbial mitigations.

Course Format:

- Instructor will lecture on review and research papers, reference list will be provided
- Informal student round table discussion with assigned discussion leaders will be based on research papers.
- Introduction to microbiological and molecular protocols

Lab Format:

- Protocols will be selected from topics and research discussed in class
- Lab notebooks will be used to record results **individually**.
- Lab write-up required for each lab

Grading:

Exam (20%): A midterm exam will be given on Sept 30 on Sections 1 and II described below.

Class Participation (20%): Class attendance is required and participation counts!!! Classes will be a combination of lecture and round table discussion on selected papers. Papers listed under lecture presentations are to be read before class and provide background for class. Paper in discussion sections will be discussed in class. A discussion leader will be assigned for each paper listed in syllabus during discussion sessions. As discussion leader you should give an informal (no slides) overview of the paper(s) in about 10 min. If you are not leading the discussion, you will also be evaluated on the questions or comments that you contribute to the discussion. This will be part of your overall participation grade. Questions should be designed to address areas that are unclear to you, generate discussion, and demonstrate that you have read the paper.

Oral Presentations (20%): Each student will give one lecture presentation (now listed as to be determined =TBD in syllabus) on a topic of their choice and will be responsible for selecting the papers (at least 3) to be used in the presentation. Suggested topics include (but are not limited to) PCR applications, biosensors, any pathogen except Salmonella, genomics, metabolomics, fermentations, probiotics, vaccines, etc. You will be graded on your selection of papers, on your presentation, and on the discussion following lecture. Presentations (30 min.) will consist of describing journal articles in the following format:

- a) Discuss background (why is this an important topic?)
- b) Methods (exactly how did they do it?)
- c) Results (what the heck happened?)
- d) Conclusions (what does it all mean?).

Lab notebooks (10%): Notebooks will be completed in an electronic format and turned in to TAs within a week of the end of each lab module. For each experiment please state the following:

1. State purpose of experiment and sufficient background to explain results,
2. Description of methods, equipment, and/or references
3. Results should include raw data and analysis of results, i.e. tables and figures
4. Conclusions
5. Final data presentation and discussion of results and conclusions

Independent Research Project (30%) – The final module for this course will consist of independent study on a selected topic of your choice. Your project should demonstrate your abilities in research design and data analysis. Investigations should include molecular methods described in this course. An outline of your proposal for this project will be submitted by September 19, 2011 to instructor for approval, and proposal will be presented to class on Oct. 28 for discussion. Class oral presentations (15 min) for projects will be done Dec 3 and 4, 2013. Using ASM format, you will also write up the results of your project as a paper, which is due December 7, 2013.

Course Outline:

I. GROWTH AND SURVIVAL: “Wanted Dead or Alive?”

- Enumeration
- Environmental adaptations to stress: heat shock, sporulation, acid tolerance
- Biofilm formation and quorum sensing

II. TOOLS OF THE TRADE:

- Indicator concept: Enrichment, Fecal coliforms
- Molecular methods: selection: DNA colony hybridizations, PCR, QPCR, RT-PCR.
- Phenotypic methods: Biotyping, Serology
- Molecular typing: PFGE, PCR-based methods, RT-PCT, genomics, microarray

III. THE USUSAL SUSPECTS:

- Norovirus and other enteric viruses
- E.coli/ Shigella/: Toxins, animal models
- Salmonella: Invasion, type III secretion
- Listeria: Intracellular pathogens
- Campylobacteria: Immune evasion: Inflammation, cellular vs. humoral response
- Vibrios: Defining virulence

IV. EMERGING SUSPECTS:

- New Bugs: E. coli
- New Places: Cholera in Haiti (yes more vibrios)
- Better Bugs: Anitbiotic resistance

V. SOLUTIONS:

- Interventions: “The only good bug is a dead bug?”
- Antibiotics: problems and answers
- Vaccines
- Probiotics
- Mitigations

Useful websites:

<http://www.foodsafety.gov/~fsg/fsgpath.html>

<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5714a2.htm>

<http://www.cdc.gov/foodnet/>

<http://epi.ufl.edu/>

<http://www.fsis.usda.gov/>

<http://www.cfsan.fda.gov/~ebam/bam-toc.html>

Academic Honesty

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: “*We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.*” You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: “*On my honor, I have neither given nor received unauthorized aid in doing this assignment.*”

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <http://www.dso.ufl.edu/SCCR/honorcodes/honorcode.php>.

Software Use:

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Campus Helping Resources

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university’s counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- *University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, www.counseling.ufl.edu/cwc/*
 - Counseling Services
 - Groups and Workshops
 - Outreach and Consultation
 - Self-Help Library
 - Training Programs
 - Community Provider Database

- *Career Resource Center, First Floor JWRU, 392-1601, www.crc.ufl.edu/*

Services for Students with Disabilities

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation. 0001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc/

FOS 6226C COURSE SCHEDULE 2013

DATE	TOPICS	Format	Assigned Reading	LAB
Aug 22			Introduction	
26	LAB		Daniela Pinto, et al. 2013. Thirty years of viable but nonculturable state research: Unsolved molecular mechanisms. <i>Critical Reviews of Micro.</i> http://informahealthcare.com/doi/pdfplus/10.3109/1040841X.2013.794127	1. VBNC: • Inoculation • Enumeration
27	I. GROWTH and Survival:	Lecture	Nilsson et al. 1991. Resuscitation of <i>V. vulnificus</i> . <i>J Bact.</i> 173:5054-959. Kelly et al. 2000. Bacterial dormancy. <i>Curr Opin Micro</i> 3:238-243.	
28	LAB		Nilsson et al., 1991a. Formation of Nonculturable <i>Vibrio vulnificus</i> . <i>Appl. Env. Microbiol.</i> 57:2640-2644	• Resuscitation • BacLight
29	Biofilm	Discussion	Valderrama WB, 2013. An ecological perspective of <i>Listeria monocytogenes</i> biofilms in food processing facilities. <i>Crit Rev Food Sci Nutr.</i> 53(8):801-17. http://www.tandfonline.com/doi/full/10.1080/10408398.2011.561378#tabModule	
Sept 2	LAB		Lab handout	2. Environmental Sampling:
Sept 3	II. TOOLS OF THE TRADE: Sampling methods	Lecture	Berger et al. 2010 . Fresh fruit and vegetables in transmission of pathogens. <i>Environ Microbiol.</i> 12:2385-239. ftp://ftp.csc.egov.usda.gov/WSI/pdffiles/Pathogens_in_Agricultural_Watersheds.pdf	
4	LAB		Lab Handout	• MPN
5	PCR 101	Lecture	Primer Design Workshop	
9	LAB		Lab Handout	• MPN
10	Molecular Typing 101	Lecture	Zou et al. 2011. Microarray analysis of virulence gene profiles in <i>Salmonella</i> serovars. <i>JIDC</i> 5:94-105. Foley et al., 2007. Comparison of molecular typing method for <i>Salmonella</i> . <i>Foodborne Pathogens and Disease.</i> 4:253-276	
11	LAB		Lab Handout	• MPN
12	TBD	Lecture		
16	LAB		Lab Handout	3. QPCR LAB • Extraction
17	TBD	Lecture		
18	LAB		Lab Handout	• Analysis
19	RT-PCR	Discussion	TBD	
23	LAB		Lab Handout	4. RT-PCR LAB • Extraction

24	III. THE USUAL SUSPECTS:	Jones	Koopmans and Duizer, 2004. Foodborne viruses: an emerging problem. Int. J. Food. Micro. 90:23-41; Patel, M.M. et al. 2009 Norovirus: a comprehensive review. J. Clin. Virol. 44:1-8	
25	LAB		Lab Handout	• Analysis
26	Norovirus	Jones	Atreya, 2004. Foodborne viruses and vaccines. Foodborne Pathogens and Dis. 1:89-96; Tamminen K, et al. 2013. Trivalent combination vaccine induces broad heterologous immune responses to norovirus and rotavirus in mice. PLoS One. 26;8(7) http://www.plosone.org/article/fetchObject.action?uri=info%3Adoi%2F10.1371%2Fjournal.pone.0070409&representation=PDF	
30	Midterm Exam (NO LAB)			
Oct 1	<i>Salmonella</i>	Lecture	Foley and Lynne. 2008. Food-associated Salmonella challenges. J Anim. Sci. 86:E173-E187. Zheng et al., 2013. Colonization and internalization of Salmonella enterica in tomato plant. Appl Environ Microbiol. 2013 Apr;79(8):2494-502. http://aem.asm.org/content/79/8/2494.full.pdf+html	
2	LAB		Lab Handout	5. MLST lab • Introduction
3	<i>Salmonella</i>	Discussion	Heithoff et al. 2008. Human Salmonella. AEM. 74:1757-66. Fatica MK, Schneider KR. Salmonella and produce: survival in the plant environment and implications in food safety. Virulence. 2011. 2(6):573-9 https://www.landesbioscience.com/journals/virulence/article/17880/?nocache=273427847 .	
7	LAB		Lab Handout	• Sequencing
8	TBD	Lecture		
9	LAB		Lab Handout	• Analysis
10	<i>E. coli</i>	Discussion	Nataro et al., 2004. Pathogenic <i>E. coli</i> . Nature Reviews. 2: 134-140	
14	LAB			6. Genomics Lab
15	<i>Listeria</i>	Discussion	Di Bonaventura et al., 2008. J Appl Microbiol. 2008 Influence of temperature on biofilm formation by <i>L. monocytogenes</i> on various food-contact surfaces: relationship with motility and cell surface hydrophobicity. 104(6):1552-61.	
16	LAB		Lab Handout	Genomics cont

17	TBD	Lecture		
21	LAB		Lab Handout	<u>7. Resistance</u>
22	TBD	Lecture		
23	LAB		Lab Handout	Resistance cont.
24	<i>Vibrios</i>	Discussion	Wright et al., 2009. Current Opinion Biotech. 20:172-177.	
28	<u>8. Independent Project Preview</u>			
29	TBD	Lecture		
30	8. Independent Project cont			
31	<i>Campylobacter</i>	Discussion	Axelsson-Olsson D, et al., 2005. Protozoan Acanthamoeba polyphaga as a potential reservoir for Campylobacter jejuni. Appl Environ Microbiol. 2005 Feb;71(2):987-92. http://aem.asm.org/content/71/2/987.full.pdf+html	
Nov 4	8. Independent Project			
5	<u>IV. EMERGING SUSPECTS:</u> New bugs	Lecture	TBD	
6	8. Independent Project			
7	Better bugs		Ahmet Koluman1 and Abdullah Dikici 2013. Antimicrobial resistance of emerging foodborne pathogens: Status quo and global trends. Critical Reviews in Microbiology, 2013; 39(1): 57–69. http://informahealthcare.com/lp.hscl.ufl.edu/doi/pdf/10.3109/1040841X.2012.691458	
11	8. Independent Project			
12	New places	Discussion	Piarroux et al. 2011. Understanding the Cholera epidemic, Haiti. Emerg. Infect. Dis. 17:1161-1167. http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19870 ONifade et al., 2011. Toxin producing <i>V. cholera</i> O75 outbreak.	
13	8. Independent Project			
14	<u>V. SOLUTIONS:</u> Risk Monitoring Assessment	Danyluk	McEgan R, et al., 2013. Predicting Salmonella populations from biological, chemical, and physical indicators in Florida surface waters. Appl Environ Microbiol. 79(13):4094-105. http://aem.asm.org/content/79/13/4094.full.pdf+html Scallan et al. 2011. http://www.cdc.gov/eid/content/17/1/pdfs/7.pdf	

18				8. Independent Project
19	Interventions	KC Jeong	Jeong, KC. 2011. Reduction of <i>Escherichia coli</i> O157:H7 Shedding in Cattle by Addition of Chitosan. Appl Environ. Microbiol.77:2611-6Lebeer et al., 2008	
20				8. Independent Project update
21	Genomics		Cao G, et al. 2013. Phylogenetics and differentiation of Salmonella Newport lineages by whole genome sequencing. PLoS One. 8(2) http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0055687	
25				NO LAB
26	Food Security		Saeed Akhtar et al., 2013. Microbiological food safety: a dilemma of developing societies. CRITICAL REV MICRO. http://informahealthcare.com.lp.hscl.ufl.edu/doi/pdf/10.3109/1040841X.2012.742036	
27	Lab notebook DUE			
28	THANKSGIING			
Dec 2				NO LAB
3	Student Oral Presentations from your project -15 min each			
4	Student Oral Presentations from your project -15 min each			
7	PROJECT WRITE-UP			